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THOMAS, KAYDEN, HORSTEMEYER & RISLEY, LLP 100 GALLERIA PARKWAY, NW STE 1750 ATLANTA, GA 30339-5948			TRAN, KHANH C	
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			2611	

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Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 09/785,366	<b>Applicant(s)</b> BETTS, WILLIAM L.	
	<b>Examiner</b> Khanh Tran	<b>Art Unit</b> 2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 20 March 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) See Continuation Sheet is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 3-5, 7-12, 14, 16-18, 20-29, 31-40, 42-46, 48-52, 54-58, 60-64 and 66-105 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02/16/2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

Continuation of Disposition of Claims: Claims pending in the application are 1,3-5,7-12,14,16-18,20-29,31-40,42-46,48-52,54-58,60-64 and 66-105.

## **DETAILED ACTION**

1. The Request for Continuing Examination (RCE) filed on 03/20/2006 has been entered. Claims 1, 3-5, 7-12, 14, 16-18, 20-29, 31-40, 42-46, 48-52, 54-58, 60-64 and 66-105 are pending in this Office action.

### ***Response to Arguments***

2. Applicant's arguments, see pages 25-36 of Applicant's Remarks, filed on 03/20/2006, with respect to the rejection(s) of claim(s) 1, 3-5, 7-12, 14, 16-18, 20-29, 31-40, 42-46, 48-52, 54-58, 60-64 and 66-91 under 35 U.S.C 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Lin et al. U.S. Patent 6,553,063, Williams et al. US 5,995,548, Wei US Patent 5,559,561, Browlie US Patent 5,493,586 and Eyuboglu et al. US Patent 5,214,672, previously cited the last Office action. See explanation in claim rejection.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 7-9, 11-12, 14, 20-22, 24-26, 31-33, 35-36, 40, 42-43, 48, 52, 54-55, 60, 64, 66-67, 71-82, 87 and 92-105 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. U.S. Patent 6,553,063 B1.

Regarding claim 1, Lin et al. invention is directed to an apparatus and method for communicating information using fractional bit-per-symbol signaling rates responsive to communication channel conditions. In column 3 lines 25-41, Lin et al. discloses a general inventive concept in figure 1 that illustrates a communication device 1. The communication device 1 includes data transformer 4 and controller 5, wherein the communication device 1 can be representative of a transmitter, a receiver, or both, see column 1 lines 50-52. In light of the foregoing teachings, the transmitter in figures 2 4 can be a transceiver and the receiver in figures 3 6 can be a transceiver also.

Lin et al. invention does not expressly teach the *claimed step of the information comprising logic for encoding an integer number of bits into a plurality symbols and relating to a plurality of signal space constellation points supported by the destination transceiver*".

In column 3 lines 30-40, referring to figure 1, Lin et al. teaches that in a case where device 1 represents a receiver, input data stream 2 can be the transmitted symbols as detected at the receiver, and output data stream 3 can be the recovered data bits which correspond to the data bits entering a transmitter.

Furthermore, as recited in the last Office action, in column 8, lines 35-55, constellation selection controller 82 of a receiver 75 can inform demodulator 76, sequence estimator 78, demapper 79, and parallel-to-serial converter 81 of the

pertinent details of the constellation being implemented at a particular moment, such as the current symbol alphabet and the number of bits in recovered symbol 86. Because the received symbols include the pertinent details of the constellation being implemented at a particular moment, one of ordinary skill in the art at the time the invention was made would have recognized that the received symbols include logic for informing the transmitter the current symbol alphabet and the number of bits in recovered symbol. As further taught by Lin et al., it is desirable for controller 82 to allow different sets of symbol alphabets and provide a variable number of bits in a symbol, responsive to a channel state. The foregoing discussion addresses Applicant's argument on page 25 of Applicant's remarks that Lin discloses, at most, that "constellation mapper 47 can employ constellation table 48 to map each vector into transmission symbol 50 that is a member of one or more preselected symbol alphabets".

As recited above, in column 8 lines 35-55, the constellation selection controller 82 (see figure 6) uses the pertinent details of the constellation being implemented at a particular moment, such as the current symbol alphabet and the number of bits in recovered symbol 86 and a channel state, to allow different sets of symbol alphabets and provide a variable number of bits in a symbol to the transmitter. Lin et al. further teaches that it is desirable to provide some form of synchronization between the controller 91 in transmitter 90 (corresponding to the claimed destination transmitter), and the constellation selection controller 82 in receiver 75. In column 5 lines 6-35, Lin et al. gives examples to show ratio of the

integer number of bits and the plurality of symbols being a non-integer. In the first example, the data bit rate is 7.073 data bits per transmitted symbol.

See figure 2, in column 4 lines 1-15, Lin et al. teaches the encoder and mapper encodes the symbols into a plurality of analog symbols corresponding to the space constellation points in the constellation table 16.

Regarding claim 7, see figure 2, the constellation table 16, including signal space constellation points. In column 4 lines 1-14, the constellation selection controller 18 governs the selection of the selectable integer number of data bits in a transmission symbol based on the desired sets of symbol alphabets and the desired variable number of bits in a symbol provided based on the received symbols from the destination transmitter 90; see figure 6. The encoder and constellation mapper 17 maps plurality of transmit symbols into plurality of analog symbols using signal space constellation points in the constellation table 16.

Regarding claim 8, in column 3 lines 60-65, Lin et al. expresses that channel state monitoring (i.e. channel conditions) is continuous, and that selection of the selectable predetermined integer number of data bits used to form a transmission symbol is adaptive to a present condition of the data channel. In light of that, the foregoing disclosure is equivalent to an encoding algorithm, and the encoding an integer number of data bits into transmission symbols is performed adaptively using the encoding algorithm, as claimed in the instant application.

Regarding claim 9, as disclosed in column 2 lines 44-51, a forward error correction code (FEC) with proper code rate can be added such that the information bit rate could further be adapted to a signal constellation size that is an integer or a power-of-two. Hence, the encoding of each of plurality of symbols into one of a plurality of analog symbol corresponding to the signal space constellation points, as taught in Lin et al., can be based on the output of a FEC code device as appreciated by one of ordinary skill in the art.

Regarding claim 11, figure 3 illustrates a receiver 24 for receiving transmitted symbols as an input data stream 25, the receiver 24 corresponding to the destination transmitter as claimed in the instant application. The input data stream corresponds to the claimed plurality of analog symbol.

Regarding claim 12, Lin et al. does not expressly teach providing the plurality of analog symbols corresponding to the signal space constellation points to the destination transceiver via a DSL as claimed in the instant application.

In column 8 lines 60-65, Lin et al. expresses the principles of the invention can also be applied to the design of modems for use in data communications. Hence, the transmitter and receiver in figures 2 and 3 can be part of two modems communicates with each other. The concept of using symbol constellations, trellis coding, fractional coding, QAM modulation is well known in the art of digital radio and voice band modem art, see column 1 lines 30-43. Therefore, it would



have been obvious for one of ordinary skill in the art at the time the invention was made that Lin et al. invention can be applied to modem arts, and transmission of the plurality of analog symbols corresponding to the signal space constellation points can be implemented through a DSL line as claimed in the instant application.

Regarding claim 14, claim 14 is rejected on the same ground as for claim 1 because of similar scope.

Furthermore, as recited in claim 1, the device 1 in figure 1 can include both transmitter and receiver. Master controller 8 is operably connected to a corresponding receiver. In a transceiver case, master controller 8 can be part of the receiving section. The receiving section is a means for receiving information associated with a destination receiver.

As recited in claim 1, bit parser 13 of figure 2 is equivalent to a fractional encoder for encoding an integer number of bits into a plurality of symbols as claimed in the instant application.

The encoder and constellation mapper 17 in figure 2 encodes each symbol into one of a plurality of analog symbols using the constellation table 16. Hence, encoder and constellation mapper 17 performs function of the claimed means of encoding.

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Regarding claim 20, said claim has similar scope as for claim 7, hence, is rejected on the same ground as for claim 7.

Regarding claim 21, said claim has similar scope as for claim 8, hence, is rejected on the same ground as for claim 8.

Regarding claim 22, said claim has similar scope of claim 9, hence, is rejected on the same ground as for claim 9.

Regarding claim 24, in addition to the rejection argument of claim 11, referring to figure 2, transmitter 11 transmits analog symbols to a receiver. Hence, transmitter 11 corresponds to the claimed means for providing the plurality of analog symbols.

Regarding claim 25, said claim has similar scope as for claim 12, hence, is rejected on the same ground as for claim 12.

Regarding claim 26, claim 26 is rejected on the same ground as for claim 1 because of similar scope. As recited in claim 1, the device 1 in figure 1 can include both transmitter and receiver.

- In column 3 lines 59-65, master controller 8 may be operably connected to a corresponding receiver; see figure 6. Channel state monitoring is continuous, and that selection of the selectable predetermined integer

number of data bits used form a transmission symbol is adaptive to a present condition of the data channel.

- In column 5 lines 6-35, the bit parser 13 (see figure 2) can selectively and adaptively partition the stream of incoming data bits 10 into k data bit vectors, and k+1 data bit vector (k is an integer number), wherein each of data bit vectors is grouped as a transmission symbol. In view of that, the bit parser 13 performs function of the claimed fractional encoder to encode the integer number of bits into plurality of transmit symbols.
- The encoder and constellation mapper 17 encodes and maps each of transmit symbols into each of analog symbols corresponding to the signal space constellation points specified in the constellation table 16.
- The transmitter 11 inherently includes a transmitting portion to transmit analog symbols to the destination transceiver.

Regarding claim 31, claim 31 is rejected on the same ground as for claim 7 because of similar scope.

Regarding claim 32, said claim has similar scope as for claim 8, hence, is rejected on the same ground as for claim 8. As recited in claim 27, the bit parser 13 can selectively and adaptively partition the stream of incoming data bits 10 into k data bit vectors, and k+1 data bit vector (k is an integer number), wherein each of data bit vectors is grouped as a transmission symbol. In view of that, the bit parser 13 performs

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a function of the claimed fractional encoder to encode the integer number of bits into plurality of transmit symbols.

Regarding claim 33, said claim has similar scope as for claim 9, hence, is rejected on the same ground as for claim 9. As recited in claim 26, the encoder and constellation mapper 17 encodes and maps each of transmit symbols into each of analog symbols corresponding to the signal space constellation points specified in the constellation table 16.

Regarding claim 35, said claim is rejected on the same ground as for claim 12 because of similar scope.

Regarding claim 36, claim 36 is rejected on the same ground as for claim 1 because of similar scope. As recited in claim 1, communication device 1 includes both transmitter and receiver, e.g. transmitter in figure 4 and receiver in figure 3.

Regarding claim 40, as recited in claim 1, the signal to noise ratio of the *received symbol* is used to determine channel condition metrics. The information comprises a number of signal space constellation points associated with the other transceiver.

Regarding claim 42, claim 42 is rejected on the same ground as for claim 20 because of similar scope.

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Regarding claim 43, said claim has similar scope as for claim 8, hence, is rejected on the same ground as for claim 8.

Regarding claim 48, claim 48 is rejected on the same ground as for claim 36 because of similar scope.

Regarding claim 52, said claim has similar scope as for claim 40, hence, is rejected on the same ground as for claim 40.

Regarding claim 54, said claim has similar scope as for claim 42, hence, is rejected on the same ground as for claim 42.

Regarding claim 55, said claim has similar scope as for claim 43, hence, is rejected on the same ground as for claim 43.

Regarding claim 60, claim 60 is rejected on the same ground as for claim 48 because of similar scope. In this case, because the data transformer extracts the selectable predetermined integer number of data bits, therefore, the predetermined data bit rate is one of non-power of two and a non-integer, one of ordinary skill in the art would have recognized that the data transformer performs equivalent function of the claimed fractional decoder.

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Regarding claim 64, said claim has similar scope as for claim 52, hence, is rejected on the same ground as for claim 52.

Regarding claim 66, claim 66 is rejected on the same ground as for claim 54 because of similar scope.

Regarding claim 67, said claim has similar scope as for claim 55, hence, is rejected on the same ground as for claim 55.

Regarding claim 71, Lin et al. invention can utilize QAM constellations (see column 9 lines 1-14). As known in the art, PAM is one dimension extension of QAM. By impressing two separate k-bit symbols from the information sequence on two Quadrature carriers. The resulting modulation technique is called Quadrature PAM or QAM. Therefore, Lin et al. teachings encompass PAM modulation. Hence, it would have been obvious for one of ordinary skill in the art at the time the invention was made that Lin et al. teachings can apply to PAM modulation, wherein the signal space constellation points correspond to PAM levels.

Regarding claim 72, as shown in example 1, see column 5 lines 17-35, to achieve 7.073 data bits per symbol, a signal constellation of at least  $2^{7.073}$  is required. Consequently, that number of signal space constellation points are not equal to a power of 2.

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Regarding claim 73, said claim has similar scope as for claim 71, hence, is rejected on the same ground as for claim 71.

Regarding claim 74, said claim has similar scope as for claim 72, hence, is rejected on the same ground as for claim 72.

Regarding claim 75, using analogous reasoning as for claim 71, with PAM modulation system, the signal space constellation points correspond to PAM levels, and the encoder and constellation mapper 17 in figure 2 corresponds to PAM mapper, respectively.

Regarding claims 76, 79 and 81, said claims have similar scope as for claim 72, hence, is rejected on the same ground as for claim 72.

Regarding claims 77-78 and 80, using analogous reasoning as for claim 75, claims 77-78 are rejected on the same ground as for claim 75.

Regarding claim 82, said claim has similar scope as for claim 77, hence, is rejected on the same ground as for claim 77.

Regarding claim 87, said claim has similar scope as for claim 77, hence, is rejected on the same ground as for claim 77.

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Regarding claim 92, as recited in claim 1, Lin et al. the received symbols include pertinent details of the constellation being implemented at a particular moment, such as the current symbol alphabet and the number of bits in recovered symbol 86. In view of that, the current symbol alphabet and the number of bits in recovered symbol 86 correspond to the claimed mapping values for arrangement in at least one look-up table. Further more, Lin et al. teaches that it is desirable for controller 82 to allow different sets of symbol alphabets and provide a variable number of bits in a symbol, responsive to a channel state; see column 8 lines 40-55. Referring to figure 6, in column 8 lines 30-50, constellation tables 80 of the receiver typically corresponds to similar constellation tables in transmitter 90. In view of all of that, constellation mapper 47 employ constellation table 48 to map each vector into transmission symbol 50 that is member of one or more preselected symbol alphabets which themselves correspond with symbol constellation.

Regarding claims 93-103 and 105, claims 93-103 and 105 are rejected on the same ground as for claim 92 because of similar scope.

Regarding claim 104, claim 104 is rejected on the same ground as for claim 1 because of similar scope.

4. Claims 3-4, 16-17, 27-28, 37-38, 44-45, 49-50, 56-57, 61-62, 68-69, 83-84 and 88-89 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. U.S.



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Patent 6,553,063 B1 and Wei U.S. Patent 5,559,561 as applied to claims 1, 14, 26, 36, 43, 47-48, 59-60 and 67 above, and further in view of Williams et al. U.S. Patent 5,995,548.

Regarding claim 3, Lin et al. does not teach the encoding an integer number of bits into a plurality of symbols involves modulus conversion. In another US Patent, Williams et al. invention provides a combined frame mapping technique that uses aspects of Minimum Modulus Conversion (MMC) and Shell Mapping (SM) to map data bits to a sequence of data symbols. As expressed in the invention, see column 9 lines 15-30, Multiple Modulus Conversion is a method of converting blocks of binary data to a corresponding block of M-ary symbols to maximize the data rate while minimizing the required signal-to-noise ratio (SNR) to achieve a desired error rate. A consequence of using MMC is that it allows a non-integer number of bits to be mapped to each symbol, which increases efficiency because the constellation sizes are not restricted to powers of two (i.e., a fractional number of bits/symbol are allowed). In view of the foregoing disclosure, Williams et al. teaches a method of Minimum Modulus Conversion (MMC) and Shell Mapping (SM) which is well suited in systems using fractional bit rate encoding. Because the method maximizes the data rate while minimizing the required signal-to-noise ratio (SNR) to achieve a desired error rate, it would have been obvious for one of ordinary skill in the art at the time the invention was made that Lin et al. transmitter can be modified to implement the method of Minimum Modulus Conversion (MMC) and Shell Mapping (SM) as taught by Williams et al.. The motivation is to minimize the required signal-to-noise ratio (SNR) to achieve a desired error rate while

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maximizing the data rate. The aforementioned benefits are always desirable in communication systems. Williams et al. method further allows for tight constellation packing and constellation balancing, so that minimum number of constellation points are required for a given bit capacity, see column 9 lines 20-25.

Regarding claim 4, Lin et al. does not teach the encoding an integer number of bits into a plurality of symbols involves shell mapping. However, the method of shell mapping is also taught in Williams et al. invention, and is discussed in claim 3 above. Hence, claim 4 is rejected on the same ground as for claim 3.

Regarding claim 16, claim 16 is rejected on the same ground as for claim 3 because of similar scope.

Regarding claim 17, claim 16 is rejected on the same ground as for claim 4 because of similar scope.

Regarding claim 27, said claim has similar scope as for claim 3, hence, is rejected on the same ground as for claim 3. Referring to figure 2, the bit parser 13 can selectively and adaptively partition the stream of incoming data bits 10 into k data bit vectors, and k+1 data bit vector (k is an integer number), wherein each of data bit vectors is grouped as a transmission symbol. In view of that, the bit parser 13 performs

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a function of the claimed fractional encoder to encode the integer number of bits into plurality of transmit symbols.

Regarding claim 28, said claim has similar scope as for claim 4, hence, is rejected on the same ground as for claim 4. As recited in claim 27, the bit parser 13 can selectively and adaptively partition the stream of incoming data bits 10 into  $k$  data bit vectors, and  $k+1$  data bit vector ( $k$  is an integer number), wherein each of data bit vectors is grouped as a transmission symbol. In view of that, the bit parser 13 performs a function of the claimed fractional encoder to encode the integer number of bits into plurality of transmit symbols.

Regarding claim 37, in addition to the rejection of claim 3, Williams et al. discloses a combined frame mapping technique that uses aspects of Minimum Modulus Conversion (MMC) and Shell Mapping (SM) to map data bits to a sequence of data symbols. As disclosed in column 12 lines 8-19, the receiver has a choice to select either mapping scheme. For the MMC scheme, the decoding the received symbols involves modulus conversion.

Regarding claim 38, similar to the rejection argument of claim 37, for the shell-mapping scheme, the decoding the received symbols involves shell mapping.

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Regarding claim 44, said claim has similar scope as for claim 3, hence, is rejected on the same ground as for claim 3.

Regarding claim 45, said claim has similar scope as for claim 4, hence, is rejected on the same ground as for claim 4.

Regarding claims 49, 83 and 88, said claims have similar scope as for claim 37, hence, is rejected on the same ground as for claim 37.

Regarding claims 50, 84 and 89, said claims have similar scope as for claim 38, hence, is rejected on the same ground as for claim 38.

Regarding claim 56, said claim has similar scope as for claim 44, hence, is rejected on the same ground as for claim 44.

Regarding claim 57, said claim has similar scope as for claim 45, hence, is rejected on the same ground as for claim 45.

Regarding claim 61, said claim has similar scope as for claim 49, hence, is rejected on the same ground as for claim 49.

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Regarding claim 62, said claim has similar scope as for claim 50, hence, is rejected on the same ground as for claim 50.

Regarding claim 68, said claim has similar scope as for claim 56, hence, is rejected on the same ground as for claim 56.

Regarding claim 69, said claim has similar scope as for claim 57, hence, is rejected on the same ground as for claim 57.

5. Claims 5, 18, 29, 39, 46, 51, 58, 63, 70, 85 and 90 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. U.S. Patent 6,553,063 B1 and Wei U.S. Patent 5,559,561 as applied to claims 1, 14, 26, 43, 47-48 and 59 above, and further in view of Brownlie et al. U.S. Patent 5,493,586.

Regarding claim 5, Lin et al. does not teach the encoding an integer number of bits into a plurality of symbols involves constellation switching. However, as described in another US Patent, Brownlie et al. discloses in the Abstract a data transmission using Quadrature amplitude modulation to select for transmission symbols from two (or more) different signal point constellations; constellation switch being used to facilitate transmission of non-integral average number of bits per symbol, i.e. fractional bit rates. In column 3 lines 45-55, Brownlie et al. further expresses that the use of two constellations, rather than a single constellation, provides the flexibility not provided by a single constellation to enable operation over the range of data rates. It also provides

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flexibility on selection of the symbol rate, which may be chosen so as to maximize utilization of the available channel bandwidth while enabling standard data rates.

Because of flexibility on selection of the symbol rate in the application of fractional bit rate encoding, it would have been obvious for one of ordinary skill in the art at the time the invention was made that Lin et al. transmitter in figure 2 can be modified to implement from two (or more) different signal point constellations for constellation switching as taught by Brownie et al.. The motivation is the flexibility on selection of the symbol rate to maximize utilization of the available channel bandwidth, especially for communications system utilizing fractional bit rate encoding.

Regarding claim 18, claim 18 is rejected on the same ground as for claim 5 because of similar scope.

Regarding claim 29, said claim has similar scope as for claim 5, hence, is rejected on the same ground as for claim 5. As recited in claim 27, the bit parser 13 can selectively and adaptively partition the stream of incoming data bits 10 into  $k$  data bit vectors, and  $k+1$  data bit vector ( $k$  is an integer number), wherein each of data bit vectors is grouped as a transmission symbol. In view of that, the bit parser 13 performs a function of the claimed fractional encoder to encode the integer number of bits into plurality of transmit symbols.

Regarding claim 39, Brownie et al. discloses a method for transmitting data symbols utilizing constellation switching to provide flexibility on selection of the symbol rate to maximize utilization of the available channel bandwidth. Brownie et al., however, does not disclose a receiver for decoding the plurality of analog symbols involving constellation switching. Nevertheless, because Brownie et al. teachings apply to systems capable of transmitting fractional bits rate, Lin et al. teachings can be modified to implement constellation switching as discussed in claim 5. Lin et al. invention teaches both a transmitter and receiver, capable of transmitting and receiving fractional bit rate. If the transmitter is modified to utilize constellation switching, it would have been obvious for one of ordinary skill in the art that the decoding at the receiver would involve constellation switching.

Regarding claim 46, said claim has similar scope as for claim 5, hence, is rejected on the same ground as for claim 5.

Regarding claims 51, 85 and 90, said claims have similar scope as for claim 39, hence, is rejected on the same ground as for claim 39.

Regarding claim 58, said claim has similar scope as for claim 46, hence, is rejected on the same ground as for claim 46.

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Regarding claim 63, said claim has similar scope as for claim 51, hence, is rejected on the same ground as for claim 51.

Regarding claim 70, said claim has similar scope as for claim 58, hence, is rejected on the same ground as for claim 58.

6. Claims 10, 23, 34, 86 and 91 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. U.S. Patent 6,553,063 B1 and Wei U.S. Patent 5,559,561 as applied to claims 1, 14, 26, 47 and 59 above, and further in view of Eyuboglu et al. U.S. Patent 5,214,672 B1.

Regarding claim 10, Lin et al. does not teach the step of applying each of the plurality of analog symbols to a gain scalar. Eyuboglu et al. discusses in Background of the Invention in another US Patent, which relates to trellis precoding for fractional bits/ baud that the QAM constellation is scaled to have the same minimum distance between adjacent points. As known in the art, constellation scaling is normally performed in a communications system for having constellations with equal probability and equal minimum distance, therefore, one of ordinary skill in the art would have been motivated to modify Lin et al. teachings to apply a gain scalar to each of analog symbols corresponding to the signal space constellation points.

Regarding claim 23, gain scaling is usually performed after constellation mapping by a scaler. Lin et al. and Eyuboglu et al. do not explicitly show that. Nevertheless, one



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of ordinary skill in the art would have been motivated to implement a scaler for performing gain scaling because it is desirable to have equal probable constellation points.

Regarding claims 34, 86 and 91, said claims have similar scope as for claim 10, hence, is rejected on the same ground as for claim 10.

### ***Conclusion***

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khanh Tran whose telephone number is 571-272-3007. The examiner can normally be reached on Monday - Friday from 08:00 AM - 05:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jay Patel can be reached on 571-272-2988. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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KCT

*Khanh Cong Tran*

04/27/2006

Primary Examiner

KHANH TRAN